Fig. 1

The Scope of patent based on RPR as a MAC client
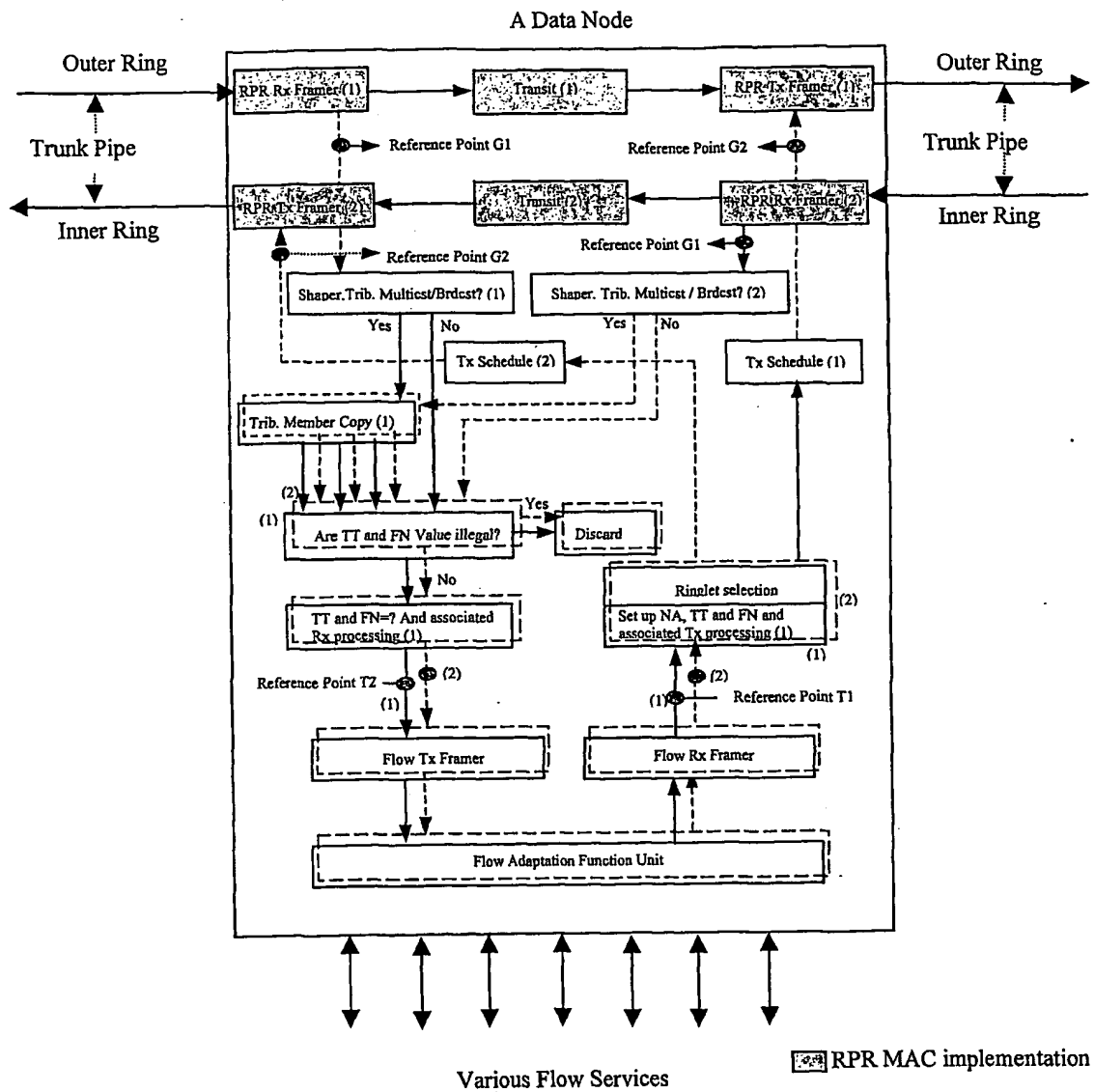
Fig. 2

Tx and Rx Diagram of a Data Node
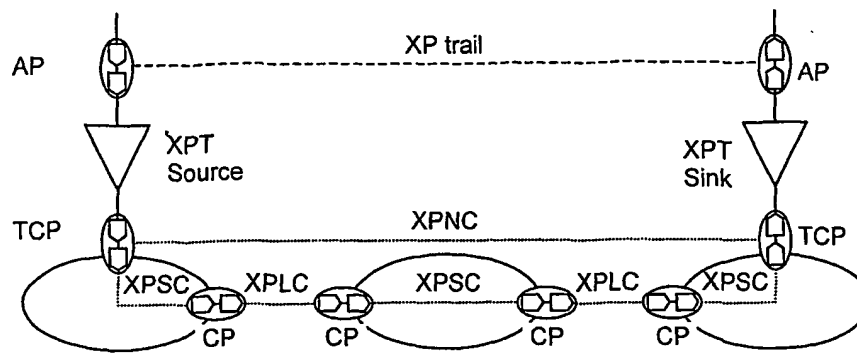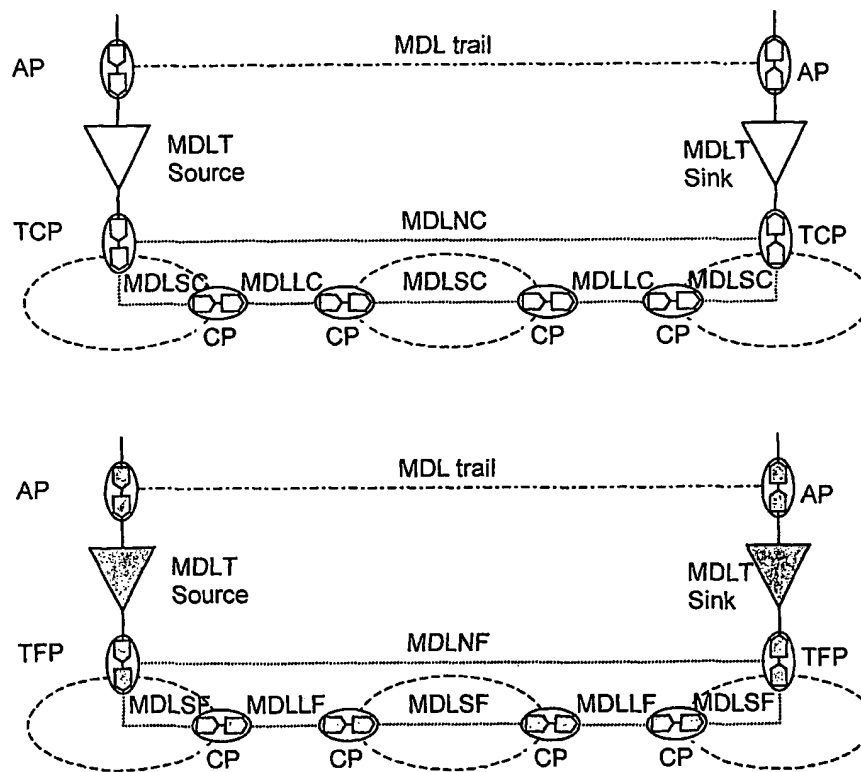
Fig. 3

XP layer network example

Fig. 4

MDL layer network example
Connection-oriented (upper) / connectionless (bottom)
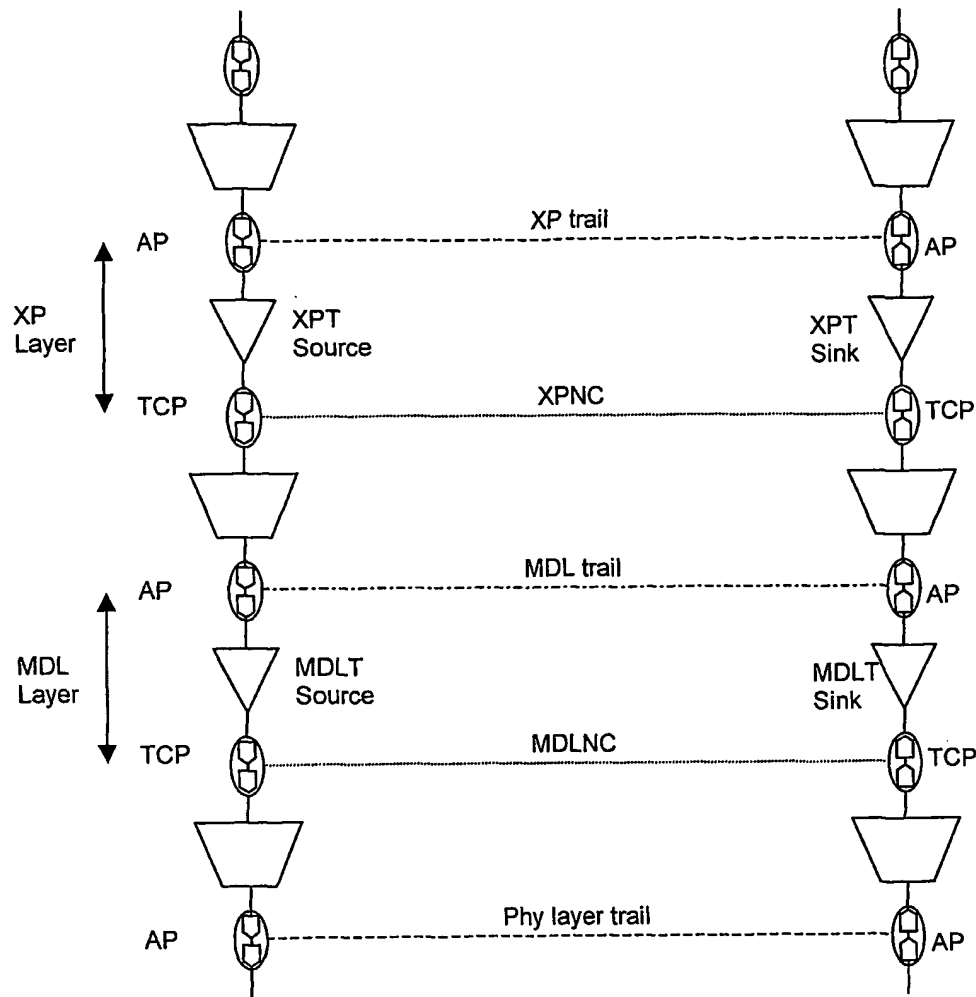
Fig. 5
Client/Server association in a MSF transport ring
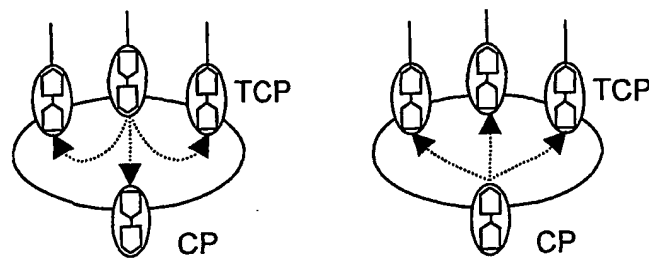
Fig. 6A
XP layer multipoint connection points examples
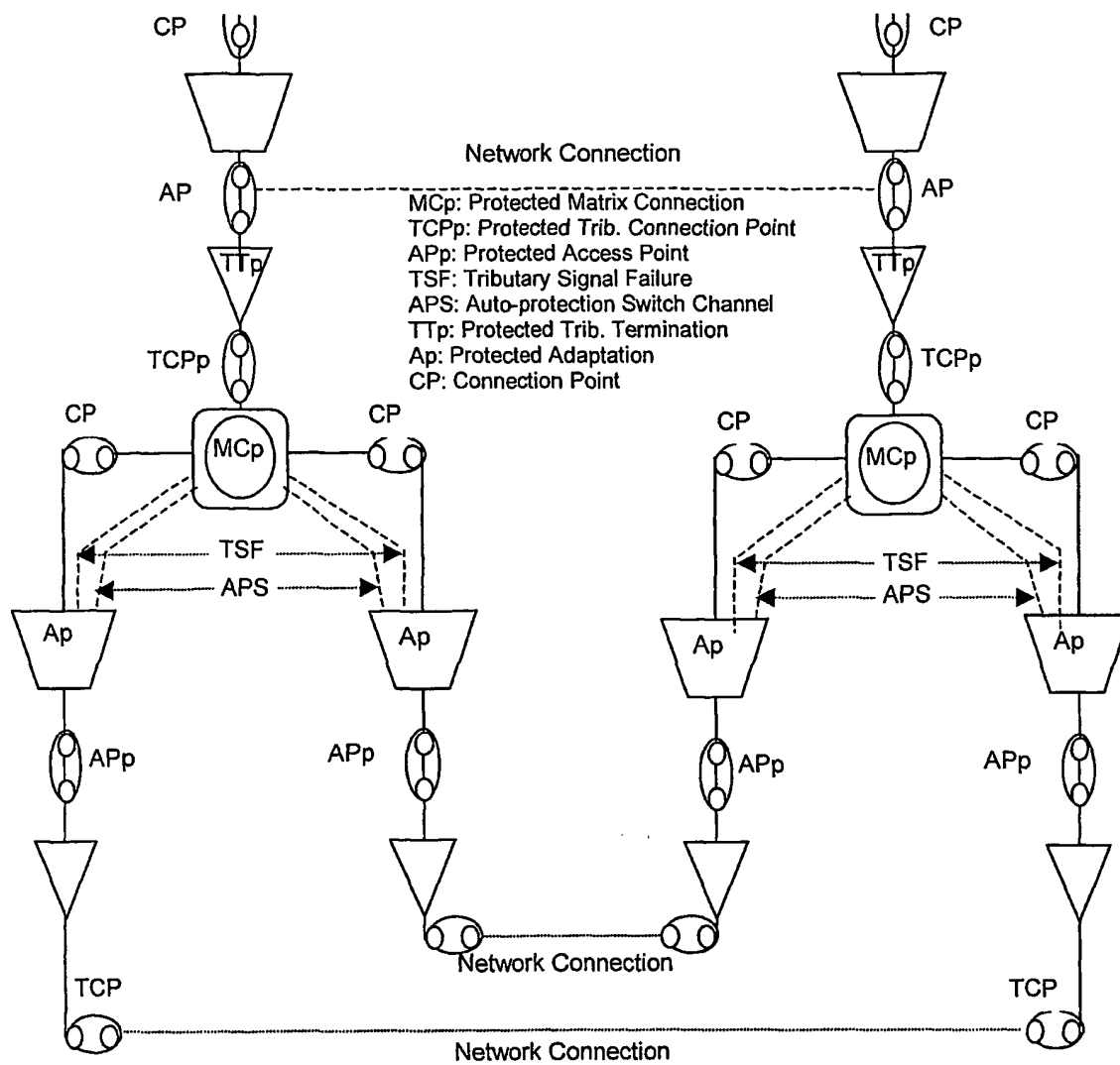
Fig. 6B
Flow Based 1+1 Protection

MCp: Protected Matrix Connection
TCPp: Protected Trib. Connection Point
APp: Protected Access Point
TSF: Tributary Signal Failure
APS: Auto-protection Switch Channel
TTp: Protected Trib. Termination
Ap: Protected Adaptation
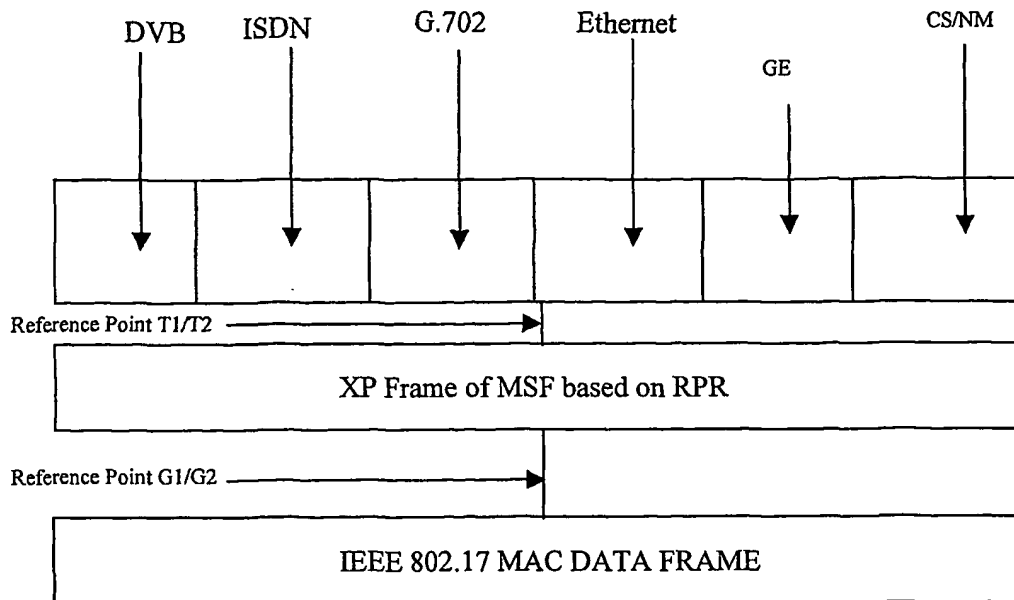CP: Connection Point

Fig. 7

Generic Protocol Stack of MSF Based on RPR
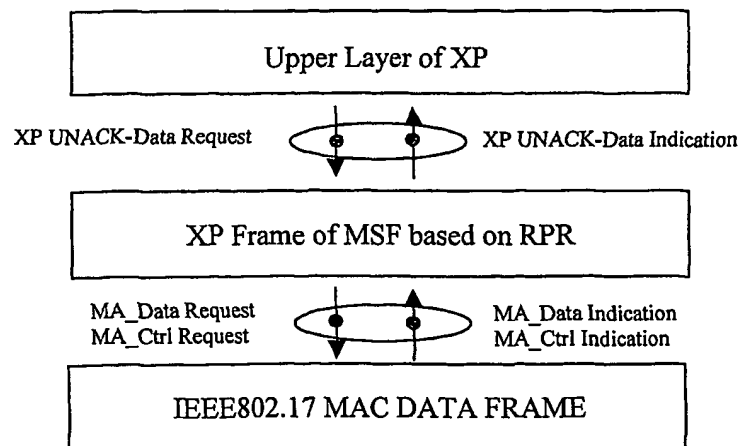
Fig. 8

Relationship between XP and RPR MAC, Upper Layer and XP

OCTET FIELDS TRANSMITTED LEFT TO RIGHT

MSB ————————————————————→ LSB

RPR HEADER	

2 octets	Ext. Protocol Type
2 octets	PT | PFI | Reserved | FT/CS/NM
2 octets	FN
2 octets	FN | Reserved | FSN
2 octets	HEC
	PAYLOAD or PARAMETERS OF this PROTOCOL
4 Octets	FCS of this link protocol
4 Octets	FCS

FIELDS TRANS-MITTED TOP TO BOTTOM

CLIENT PDU

RPR PAYLOAD FCS
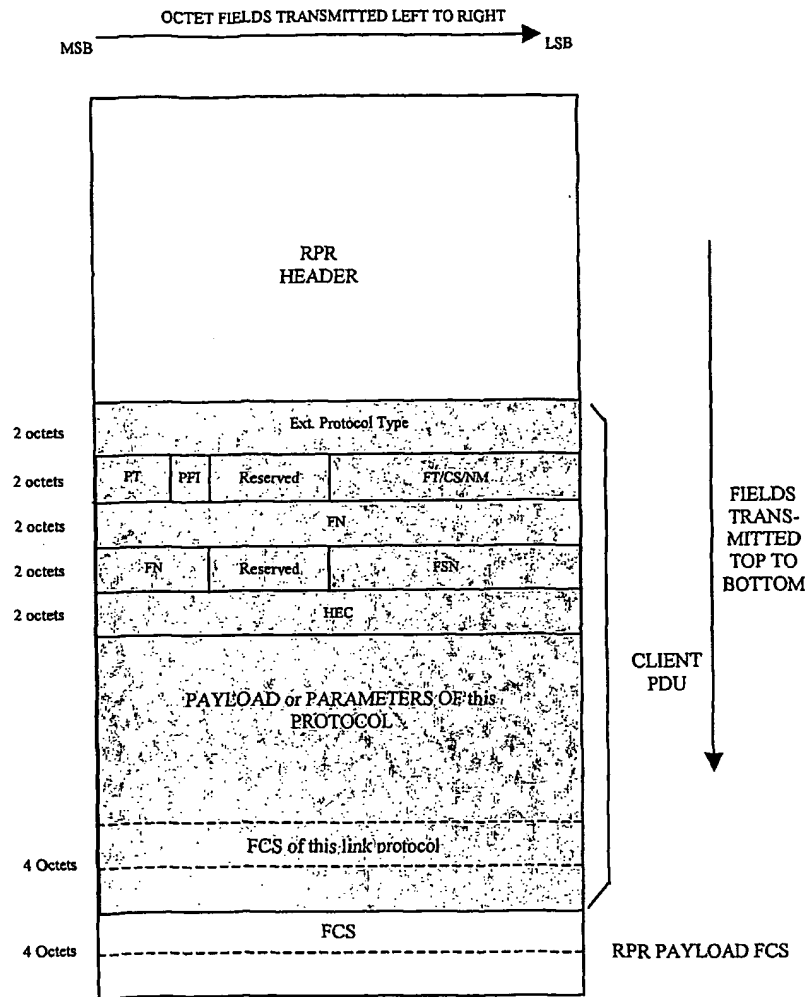
Protocol type field is 0x88bc assigned by IEEE802.

Fig. 9

Generic Frame Format

```
                          0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
                        ┌─────┬──────────┬────────────────────┐
TCCR ID =FNi ID +       │ 10  │ 000000B  │  8-bit Length field │
                        └─────┴──────────┴────────────────────┘
```

+FNj ID +FNk ID+FNm ID ......
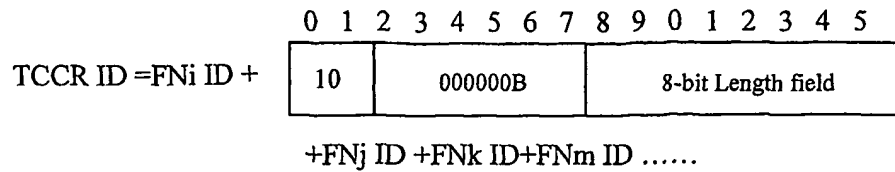
Node based multicast Mode

```
                          0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
                        ┌─────┬──────────┬────────────────────┐
TCCR ID =FNi ID +       │ 11  │ 000000B  │  8-bit Length field │
                        └─────┴──────────┴────────────────────┘
```
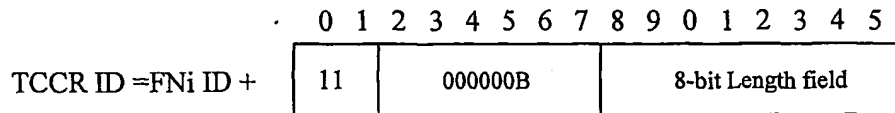
Node based broadcast Mode

```
                          0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
                        ┌─────┬──────────┬────────────────────┐
TCCR ID =FNi ID +       │ 01  │ 000000B  │  8-bit Length field │   +FNj ID
                        └─────┴──────────┴────────────────────┘
```
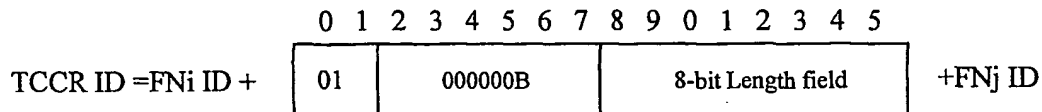
Node based unicast Mode

Fig. 10

Expressions of FN ID and TCCR ID

Note: FNi ID=NAx(x=1,2,3...256)+FT+FNp (p=0,1,2,3,...2^{20}-1), to identify the pth Flow with the fixed FT and FN value within ith node. For the case of Multicast/Broadcast Mode, a flow based outgoing packet within a source node can be multicast or broadcast to a designated or source flow (ST) of other sink nodes along a MSF ring or other topologies. Each sink node should have only a source flow to receive this packet from ringlet at a time. If a membership group of multicast or broadcast has been established within a sink node, the said ST will duplicate this packet to other flows with the same membership relation.
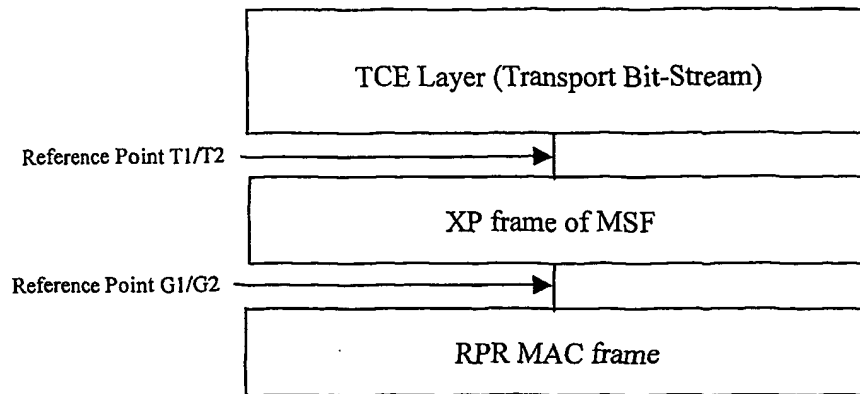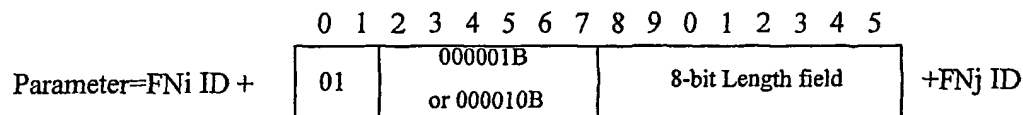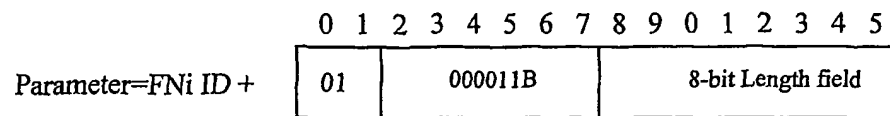
10/521999

TCE Layer (Transport Bit-Stream)

Reference Point T1/T2 ⟶

XP frame of MSF

Reference Point G1/G2 ⟶

RPR MAC frame

Fig. 11

TDM service channel over MSF

```
                0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
Parameter=FNi ID +  | 01 | 000001B     | 8-bit Length field |  +FNj ID
                    |    | or 000010B  |                    |
```

Full duplex point-to-point Mode

Note: FNi ID=NAx(x=1,2,3...256)+FT+FNp (p=0,1,2,3,...2^{20}-1), to identify the pth Flow with the fixed FT and FN value within xth node. FNi ID and FNj ID stand for standby and working flow respectively.

Fig. 12

Expressions of 1+1 and 1:1 flow protection parameters

```
                0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5
Parameter=FNi ID +  | 01 | 000011B | 8-bit Length field |
```

+FNj ID +FNk ID + FNl ID + FNm ID......

Full duplex point-to-point Mode

Note: FNi ID=NAx(x=1,2,3...256)+FT+FNp (p=0,1,2,3,...2^{20}-1), to identify the pth Flow with the fixed FT and FN value within xth node. FNi ID is used to present standby flow, and FNi ID, FNk ID, FNl ID and FNm ID etc represent working flow, the total number is N.
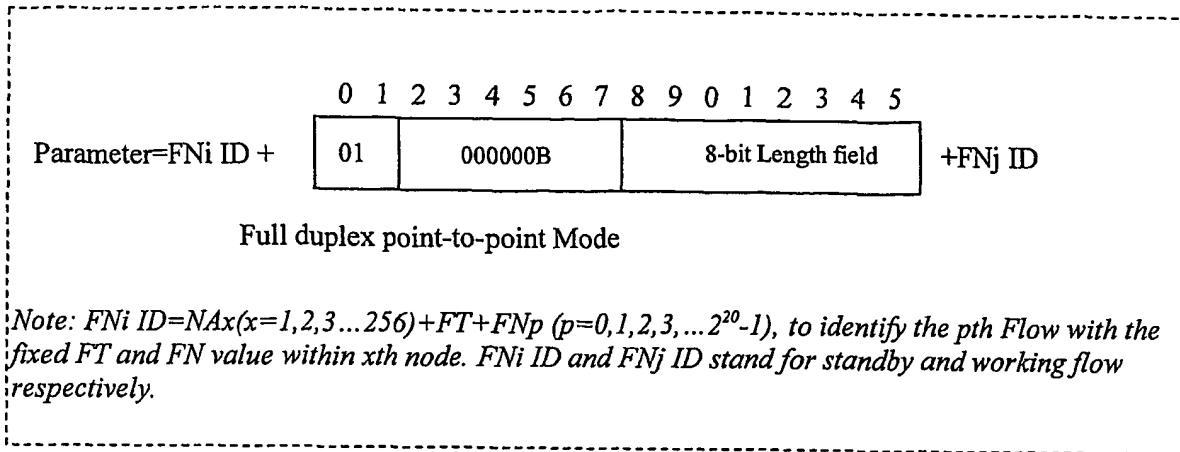
Fig. 13

Expressions of 1:N flow protection parameter

Parameter=FNi ID +

0 1	2 3 4 5 6 7	8 9 0 1 2 3 4 5
01	000000B	8-bit Length field

+FNj ID

Full duplex point-to-point Mode

Note: FNi ID=NAx(x=1,2,3...256)+FT+FNp (p=0,1,2,3,...2^{20}-1), to identify the pth Flow with the fixed FT and FN value within xth node. FNi ID and FNj ID stand for standby and working flow respectively.

Fig. 14

Expressions of 1+1 and 1:1 flow protection parameters

Parameter=FNi ID +

0 1	2 3 4 5 6 7	8 9 0 1 2 3 4 5
01	000000B	8-bit Length field

+FNj ID +FNk ID + FNm ID +......

Full duplex point-to-point Mode

Note: FNi ID=NAx(x=1,2,3...256)+FT+FNp (p=0,1,2,3,...2^{20}-1), to identify the pth Flow with the fixed FT and FN value within xth node. FNi ID is used to present standby flow, and FNi ID, FNk ID and FNm ID etc represent working flow, the total number is N.
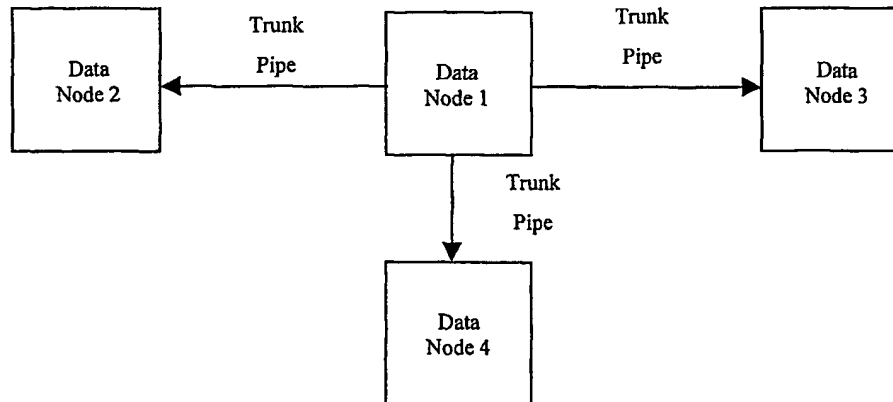
Fig. 15

Expressions of 1:N flow protection parameter

Fig. 16

A MSF Topology, Link-type with Adding and Dropping Flow Services

Fig. 17
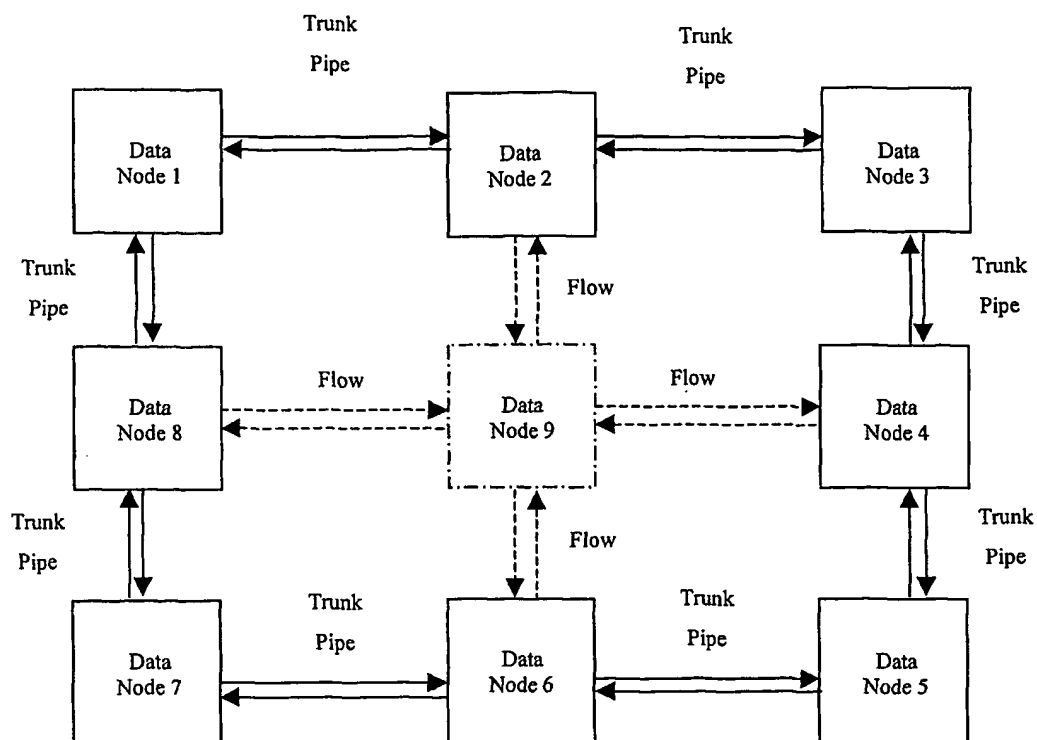
A MSF Topology, Broadcast Connection to DVB Application

Fig. 18

A MSF Topology, Pseudo-mesh Connection